

General Air Quality Information

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What are We Breathing?

Outdoor air, also called "ambient air," is a vast blanket of gases surrounding the earth. The air we breathe at ground level is a mixture of invisible and odorless gases, mostly nitrogen and oxygen, with smaller amounts of water vapor, argon, carbon dioxide, neon, helium and hydrogen.

What is Air Pollution?

We say the air is "polluted" when it contains enough unhealthy particles and gases to harm people, animals, plants, and even objects such as buildings and statues. Air pollution can be present as a solid, liquid or gas. When we see smoke, we are really seeing tiny solid particles suspended in the air. Acid rain is an example of gases and liquids mixing with otherwise clean air. Polluted air contains harmful gases and particles, usually as a result of burning.

The air we breathe depends on natural cleaning forces-- such as wind and rain-- to help remove, dilute and disperse the dirt and pollution in the air.

Where does Air Pollution come from?

Natural vs. Man-made

Natural air pollutants have always been part of the earth's history. Particles of soot and various gases from volcanoes, forest fires, and decaying organic materials in oceans and swamps enter the atmosphere at irregular intervals, sometimes at levels that have dramatic effects on our climate. Windstorms can fill the air with dust which affects the air hundreds of miles away. The explosion of ash and soot from Mt. St. Helens in May of 1980, for example, affected the air quality throughout the Pacific Northwest and the rest of the country for months after the initial eruption.

Since little can be done by humans about natural pollution, our main concern has to be with the additional pollution that comes from human activities. Most of the gaseous components of air are part of the natural cycle, and ecosystems have natural ways of keeping the many parts of the system in balance.

The problem comes when the activities of people introduce large quantities of additional compounds to the air, which can unbalance and disrupt the normal biochemical cycle.

Naturally produced pollutants are not necessarily as serious a problem as man-made pollution because they are not concentrated over large cities and many are less harmful than man-made pollutants.

Air Pollution Sources

Humans burn different materials as fuel, and the act of burning releases harmful gases that can pollute the air. In general, the quality of the air depends upon how efficiently people use fuel. Such choices affect our lives in many ways: how we choose to move around to get from place to place (transportation choices), how we heat our homes, what we do with garbage and yard waste and how society creates the many products we all use everyday, all contribute to air pollution in some fashion.

Air pollution is often the result of incomplete combustion from burning coal, wood, oil and gasoline. Pollutants are also released from materials that "evaporate".

Any place or object from which pollutants are released is a **source** of air pollution. There are many different air pollution sources. A source can be a power plant, factory, gas station or farm; cars, trucks and other motor vehicles are sources, as are woodstoves, unpaved roads, and some consumer products.

Mobile sources are sources that move around, such as cars, trucks, buses or motorcycles, and are generally transportation-related.

A source that stays in one place is considered a "stationary" or **point source**. Large stationary sources are usually industrial operations that emit with large quantities of air pollutants, such as chemical plants, oil refineries and pulp & paper mills.

A **major source** is a Clean Air Act term that refers to how much pollution the source emits. In general, a source is considered to be "major" if it emits more than 100 tons per year of one criteria pollutant, more than 10 tons per year of any single toxic air pollutant, or more than 25 tons per year of any combination of toxic air pollutants.

An **area source** is a source of air pollution where the quantity of emissions are smaller than a major source. Sometimes called non-point sources, area sources individually may not release much pollution; however, numerous area sources together can contribute quite a bit of pollution. Examples of area sources of pollution are woodstoves, unpaved roads, dry cleaners, gas stations, and small manufacturing companies.

What are the main air pollutants?

Certain air pollutants are so pervasive that they show up wherever air quality is poor. EPA uses six **criteria pollutants** as indicators of air quality: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter and lead. For each of these, EPA has established "primary" standards to protect public health, and "secondary" standards to protect other aspects of public welfare, such as preventing materials damage, preventing crop and vegetation damage, or assuring visibility. These standards are called the **National Ambient Air Quality Standards (NAAQS)**. Areas of the country where air pollution levels persistently exceed these standards may be designated as "**nonattainment areas**."

The criteria air pollutants are:

Carbon monoxide (CO): A colorless, poisonous gas formed when substances burn, particularly fuels like gasoline, oil, wood, etc. Breathing too much carbon monoxide interferes with how the body absorbs oxygen, and therefore especially affects people with respiratory and/or heart disease.

Ozone (O₃): A poisonous gas which is formed by a chemical reaction of nitrogen oxides and volatile organic compounds together with sunlight and warm temperatures. At ground-level, ozone is often referred to as "smog". Breathing too much ozone can damage lung tissue, and aggravates respiratory problems like asthma and emphysema. High ozone levels are also harmful to plants, crops and trees, as well as a variety of materials like rubber and paints.

In the upper atmosphere (approximately 10 miles above the Earth), ozone forms a protective layer around the planet which shields the Earth's surface from the sun's intense ultra-violet radiation; exposure to high levels of UV radiation due to "holes" in the ozone affects creatures like frogs and salamanders, and increases the risk of skin cancer in humans.

Nitrogen dioxide (NO₂) : A poisonous gas produced from burning fossil fuels like oil and gas; NO₂ is a major component of acid rain and ground-level ozone. Breathing too much NO₂ is harmful to the lungs and aggravates asthmatic symptoms.

Sulfur Dioxide (SO₂): A colorless gas formed during the combustion of fuels containing sulfur, such as coal. Breathing SO₂ irritates the respiratory system and aggravates asthma symptoms.

Particulate matter (PM): Very small airborne particles, less than 10 microns in diameter. Major sources of particulate matter are burning fuels, such as wood in woodstoves and fireplaces, or diesel in motor vehicles; crushing or grinding, such as dust from unpaved roads and construction sites; and from industrial processes. Breathing high levels of particulate matter is harmful to lung tissue

and aggravates asthma symptoms. Too much particulate in the air also affects visibility, obscuring how far in the distance one can see.

Lead (Pb): Lead is a heavy metal that is hazardous to human health. Lead occurs in the atmosphere as small particles, typically from emissions from lead smelters and other metal processing plants. In the past, lead was added to some gasoline to improve engine performance, and was released from a car's tailpipe. Levels of lead in the air across the country have decreased by ~90% since the Clean Air Act eliminated the production of leaded gasoline.

Volatile Organic Compounds (VOC): A large group of different compounds which each contain carbon and hydrogen (also known as "hydrocarbons"). VOCs are found in gasoline, solvents, oil based paints and inks, and in many consumer products such as aerosol spray products-- materials which "evaporate". VOCs react with nitrogen oxides, sunlight and heat to form ozone. Many VOCs are considered to be toxic air pollutants.

Toxic Air Pollutants, also referred to "hazardous air pollutants" or "air toxics", are a group of pollutants that are known or suspected to cause cancer or other serious health effects such as reproductive effects, birth defects, or to cause adverse environmental effects. There are literally thousands of sources of toxic pollutants. Because of the substantial risks to human health, these compounds are regulated separately from the criteria air pollutants. The degree to which a toxic air pollutant affects a person's health depends on many factors, including the quantity, duration, and frequency of exposures, the toxicity of the chemical and personal susceptibility.

We are exposed to literally thousands of toxic air pollutants everyday. Some of these pollutants are present in the form of gasoline, cleaning solvents, and paint strippers. Large and small manufacturing facilities, as well as people's daily automobile driving, all contribute to air toxic pollution. In the United States, 42 % of air toxic emissions come from mobile sources like cars, trucks, buses or farm equipment. Area sources or smaller sources such as dry cleaners, gas stations, and small manufacturing companies produce 34% of the air toxics nationwide. And 24% of the air toxics come from large stationary sources, known as point sources, such as chemical plants, oil refineries and pulp and paper mills.

Who controls air pollution?

EPA and the Clean Air Act

The **Clean Air Act** is the federal law meant to help keep the air clean. The law provides the legal authority for the U.S. Environmental Protection Agency's air pollution control programs. See **The Plain English Guide to the Clean Air Act** for more general information. On a national level, U.S. EPA conducts basic

research about air pollution and sets national standards for controlling pollution.

The EPA Region 10 office in Seattle administers this law in Alaska, Idaho, Oregon, Washington, and Indian country located within those states. Region 10 staff work to improve the region's air quality and protect public health by working with state and tribal governments to develop effective air pollution control programs.

State Agencies

The Clean Air Act places most of the responsibility on states to prevent and control air pollution. In order for a state to operate an air quality program, the state must adopt a plan, called a State Implementation Plan (SIP), and obtain approval of the plan from the EPA. Federal approval provides for some consistency in different state programs and ensures that a state program complies with the requirements of the Clean Air Act and EPA rules. A SIP adopted by the state government and approved by the EPA is legally binding under both state and federal law and may be enforced by either government.

Indian Tribes

The Clean Air Act also acknowledges that in some cases, it is appropriate for Indian tribes to prevent and control air pollution within the exterior boundaries of Indian Country. Although not required to do so, a tribe may develop and enact its own air quality control plan, called a Tribal Implementation Plan (TIP), and obtain approval for the plan from the EPA. A TIP adopted by a tribal government and approved by the EPA is legally binding under both tribal and federal law and may be enforced by either government.

Until a Tribal Implementation Plan is adopted and approved by EPA, or in those cases where a Tribe opts not to adopt its own program, it is EPA's responsibility to implement the Clean Air Act in Indian country. EPA recognizes the primary role for tribes in protecting air resources in Indian country, and is working with tribes to protect the air in the absence of approved tribal programs.

How is Air Quality Measured?

To prevent air pollutant levels from reaching levels that can cause harm, it is important to be able to detect the presence of air pollution and to identify their emission sources.

Measuring and monitoring air pollution is a crucial part of air pollution control. The Clean Air Act requires certain methods of monitoring for criteria pollutants in the air. All states and tribes use the same methods to detect pollution in the air, and in order to compare air quality data from one place to another, please refer to the national air quality monitoring program website for more information.

For each of the criteria pollutants, EPA has established air quality standards protecting against human health effects.